

NOTES ON THE SOFT PARTS OF *TROCHUS INFUNDIBULUM* WATSON
With an account of a remarkable Sexual Modification of the
Epipodium, hitherto undescribed in Mollusca.

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The presence of a verge, or intromittent male organ, has hitherto, among the Rhiphidoglossate Mollusks, been recorded only in *Neritina* (Claparède) and certain Limpets. The organ as it exists in *Neritina* and *Nerita*, is so short and obscure that its function and even its existence has been called in question. When I showed its existence in the rather anomalous *Addisonia paradoxa* and *Cocculina spiniigera*, curious deep-sea limpets, it was questioned whether they were not peculiarly modified *Tenioglossa*.

Since then, in several deep-sea Mollusks, such as *Rimula*, *Margarita* and others indisputably belonging to the *Rhiphidoglossa*, I have found a well-developed verge; and there is little doubt that the ancestors of this group, as well as of the *Tenioglossa*, were so provided, and that some of these deep-sea forms have retained the organ now generally obsolete in their shallow water congeners. In combination with this survival, one of the species, *Trochus infundibulum* Watson, offers a singular and very interesting special modification of the anterior portion of the epipodium on the right side, which appears worthy of particular attention.

The soft parts of this species afford several notes of interest. The external parts, except the eyes, are white. The foot is wide, straight and double-edged in front, and, as far as one can judge from specimens contracted in alcohol, must have been somewhat pointed or produced at its anterior corners in life. The sides of the foot are nearly smooth, below the epipodial line.

The muzzle is small and slender at its proximal end, enlarged and transversely semi-lunar at its distal extremity. The oral surface of the muzzle is smooth, the mouth very small; the oral disk is flat and produced on each side into a thin linguiform lappet, with simple and entire edge. These lappets are remarkably long, their ends reaching as far as the ends of the true tentacles, and serve as tactile organs, like the oral tentacles of the *Lepetidae*, or the much smaller lappets of *Aemaea*. When not feeding, or seeking food, these lappets would seem to be applied to the sides of the foot below the epipodium.

The oral disk is entire, but is slightly indented in the median line below a furrow running up toward the mouth.

The cephalic tentacles are very stout and large, very elongate-conical, with moderately pointed tips. They are situated above, and not, as in most *Trochidae*, on each side of the muzzle. Their inner bases are connate, and there is no intertentacular "veil," or any tubercular traces thereof.

The eyes are large, strongly pigmented, ovoid, and sessile on the outer bases of the tentacles, or perhaps I should say, just by the outer bases. They are not pedunculate or elevated on pedicels in any of the specimens examined, and I am quite confident that this is not caused by the contraction due to alcohol, but is normal to the species.

The epipodial apparatus is complicated, and exhibits a certain amount of variation between different individuals in the situation and number of its processes. In the males, it is subjected to a remarkable modification for sexual purposes. The epipodium begins immediately behind the eye and a trifle below it. In the females it is produced into a large broadly linguiform process, half as long as the cephalic tentacles and fringed with close-set uniform small pointed papillæ or filaments. This process exists in the male on the left side. The posterior margin then curves in toward the side of the foot; it becomes quite narrow and shows two lateral tentacles of moderate size; then a vacant space; then at the front edge of the operculum two or three filaments, small, but larger than any in the vacant space; then another, but larger one; and finally another, which is behind the middle of the operculum, and is the last on that side. The epipodial line is continued to the end of the foot, the dorsal surface above it, being transversely rugose and with a linear median furrow. On the other (right) side we find a small, a large, two subequal small, another large filament, followed by a slight gap and then by a still larger tentacular process. The flap which corresponds to the fringed process on the left side, is remarkably modified in the male.

Behind, and close to the right eye, is a small tubular, longitudinally striate, cylindrical verge, not exceeding (in alcohol) two millimetres in length. Below it the epipodial flap is enormously produced, and its front edge is rolled backward upon itself, forming a tube into the proximal opening of which the end of the verge may project. The flap is rolled so that it makes nearly two layers, and thus a very capable cylinder, which, when unrolled and released,

will immediately coil itself up again. This cylinder is of subequal diameter throughout, and is as long as, and somewhat stouter than, the cephalic tentacles. Externally, near its base, it is nearly smooth; further out, it is spirally striate; near its extremity, it becomes thicker and rather deeply externally grooved longitudinally, with short, even, close-set, slightly spiral, grooves. The opening at the distal end is fringed with short, equal papillæ, each one corresponding to the thickened interspace between two of the grooves. These raised folds, or interspaces, are also finely transversely striate. At the base of the cylinder, the epipodium extends backward to the first lateral filament; and the margin of this part is perfectly entire and simple, showing neither fringe nor granulation. The object of this apparatus is self-evident. The cylinder serves as a *conduit for the seminal fluid ejected from the verge*. Whether it may be employed in an actual copulation is doubtful; it may merely serve to spread the seminal matter over the eggs as they are deposited by the female. I am not aware that anything of this sort has been observed in any other gastropod, up to the present time.

The edge of the mantle is smooth, entire, and slightly thickened. Within the nuchal chamber the anus is visible on the right side. The end of the intestine, for a considerable distance, is free from the mantle and projects like a tentacle. The termination is slightly constricted, then enlarged into a cup, or trumpet-shaped ending, which nearly reaches the mantle-edge.

The intestine itself, after leaving the stomach, is much convoluted, but in the main, rises and is brought forward nearly to the mantle-edge above the stomach; then turns back and is carried far into the visceral coil before it is again brought forward and terminated as above described. The food consists of Foraminifera.

The gill is free, except at its base, and consists of very elongate-triangular foundation, from which depend triangular lamellæ, without a raphe and wide at their bases. These grow larger proximally.

The operculum is thin, polished, amber-colored, centrally depressed, having a central projection, or nipple, on its under-side, and consists of about four whorls.

The specimen affording the above notes has been identified with Mr. Watson's type specimen, and is now deposited with it in the British Museum. It was dredged by the U. S. Fish Commission east of Chesapeake Bay, in 1685 fathoms.